The documentation and process conversion measures necessary to comply with this document shall be completed by 2 August, 2003.

INCH POUND

MIL-PRF-19500/510D
2 May 2003
SUPERSEDING
MIL-PRF-19500/510C
5 September 1997

`PERFORMANCE SPECIFICATION

* SEMICONDUCTOR DEVICE, TRANSISTOR, NPN, SILICON, POWER
TYPE 2N6249, 2N6249T1, 2N6249T3, 2N6250, 2N6250T1, 2N6250T3, 2N6251, 2N6251T1, 2N6251T3
JAN, JANTX, JANTXV AND JANS, JANHC AND JANKC

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the performance requirements for NPN silicon, power transistors. Four levels of product assurance are provided for each encapsulated device type as specified in MIL-PRF-19500. Two levels of product assurance are provided for each unencapsulated dice type.

* 1.2 Physical dimensions. See figure 1 (similar to TO-3), figure 2 (JANHC and JANKC), figure 3 (TO254AA), and figure 4 (TO257AA).

* 1.3 Maximum ratings.

Type	P_T T_A = +25°C	P_T (1) T_C = +25°C	V_{CBO}	V_{CEO}	V_{EBO}	I_C	I_B	T_J and T_{STG}	$R_{\theta JC}$ (2)
	W	W	V dc	V dc	V dc	A dc	A dc	°C	°C/W
2N6249	6.0	175	300	200	6.0	10	5.0		1.0
2N6249T1	6.0	175	300	200	6.0	10	5.0	-65	1.0
2N6249T3	4.0	(3) 125	300	200	6.0	10	5.0		1.3
2N6250	6.0	175	375	275	6.0	10	5.0	to	1.0
2N6250T1	6.0	175	375	275	6.0	10	5.0		1.0
2N6250T3	4.0	(3) 125	375	275	6.0	10	5.0	+200	1.3
2N6251	6.0	175	450	350	6.0	10	5.0		1.0
2N6251T1	6.0	175	450	350	6.0	10	5.0		1.0
2N6251T3	4.0	(3) 125	450	350	6.0	10	5.0		1.3

(1) For temperature-power derating curves, see figures 5 and 6.
(2) For thermal impedance curves, see figures 7, 8, and 9
(3) For TO-257 devices with typical mounting and small footprint, conservatively rating at 125W and 1.3°C/W only.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Supply Center, Columbus, ATTN: DSCC-VAC, P.O. Box 3990, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

* 1.4 Primary electrical characteristics at T_A = +25°C.

Types	Limits	h_{FE}	C_{obo}	$\lvert h_{fe} \rvert$	Pulse response	
		I_C = 10 A dc V_{CE} = 3 V dc	V_{CB} = 10 V dc I_C = 0 A dc 100 kHz ≤ f ≤ 1 MHz	V_{CE} = 10 V dc I_C = 1 A dc f = 1 MHz	t_{on}	t_{off}
			pF		µs	µs
2N6249, 2N6249T1, 2N6249T3	Minimum	10		2.5		
	Maximum	50	500	15.0	2.0	4.5
2N6250, 2N6250T1, 2N6250T3	Minimum	8		2.5		
	Maximum	50	500	15.0	2.0	4.5
2N6251, 2N6251T1, 2N6251T3	Minimum	6		2.5		
	Maximum	50	500	15.0	2.0	4.5

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATION

DEPARTMENT OF DEFENSE

MIL-PRF-19500 - Semiconductor Devices, General Specification for.

STANDARD

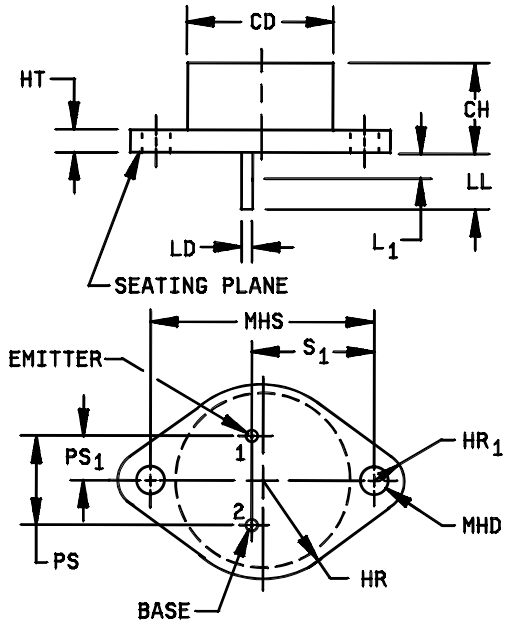
DEPARTMENT OF DEFENSE

MIL-STD-750 - Test Methods for Semiconductor Devices.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Document Automation and Production Services (DAPS), Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

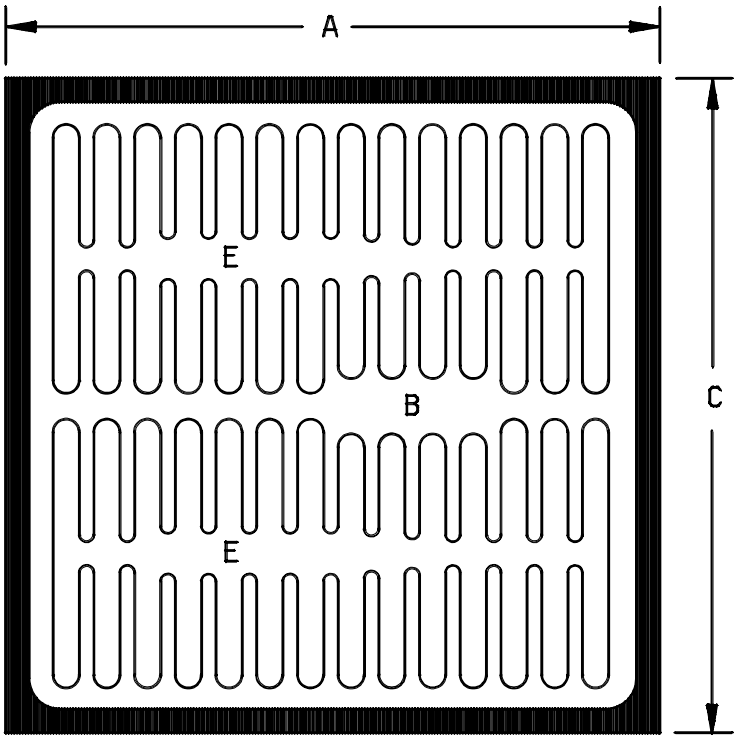
2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

Symbol	Inches		Millimeters		Note
	Min	Max	Min	Max	
CD		.875		22.23	
CH	.250	.450	6.35	11.43	
HR	.495	.525	12.57	13.34	
HR_1	.131	.188	3.33	4.78	
HT	.050	.135	1.27	3.43	
LD	.038	.053	0.97	1.35	3, 5
LL	.312	.500	7.92	12.70	3
L_1		.050		1.27	5
MHD	.151	.161	3.84	4.09	
MHS	1.177	1.197	29.90	30.40	
PS	.420	.440	10.67	11.18	2
PS_1	.205	.25	5.21	5.72	2, 3
S_1	.665	.675	16.64	17.15	2



NOTES:
1. Dimensions are in inches. Metric equivalents are given for general information only.
2. These dimensions should be measured at points .050 (1.27 mm) to .055 (1.40 mm) below seating plane. When gage is not used, measurement will be made at seating plane.
3. Two leads.
4. Collector shall be electrically connected to the case.
5. LD applies between L_1 and LL maximum. Diameter is uncontrolled in L_1.
6. In accordance with ANSI Y14.5M, diameters are equivalent to ϕ symbology.

FIGURE 1. Physical dimensions (similar to TO-3).



Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A, C	.228	.238	5.29	6.05

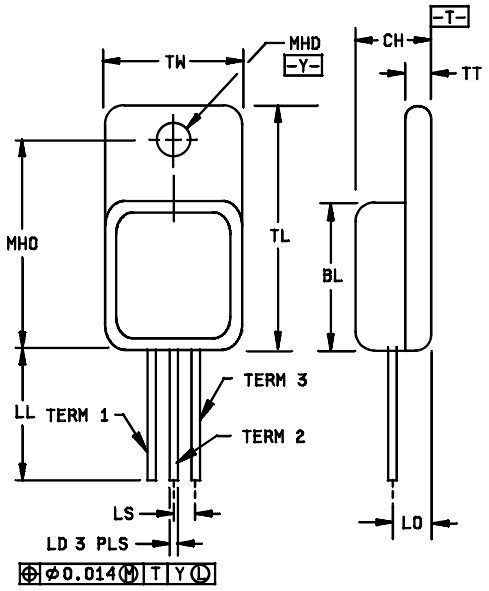
DESIGN DATA

Metalization:

Top:	Aluminum 40,000 Å minimum, 50,000 Å nominal.
Back:	Gold 2,500 Å minimum, 3,000 Å nominal.
Back side:	Collector.
Chip thickness:	.010 inch (0.254 mm) ± .002 inch (0.051 mm).
Bonding pad:	B = .016 inch (0.41 mm) x .060 (1.52 mm).
	E = .016 inch (0.41 mm) x .060 (1.78 mm).

FIGURE 2. JANC (A-version) die dimensions.

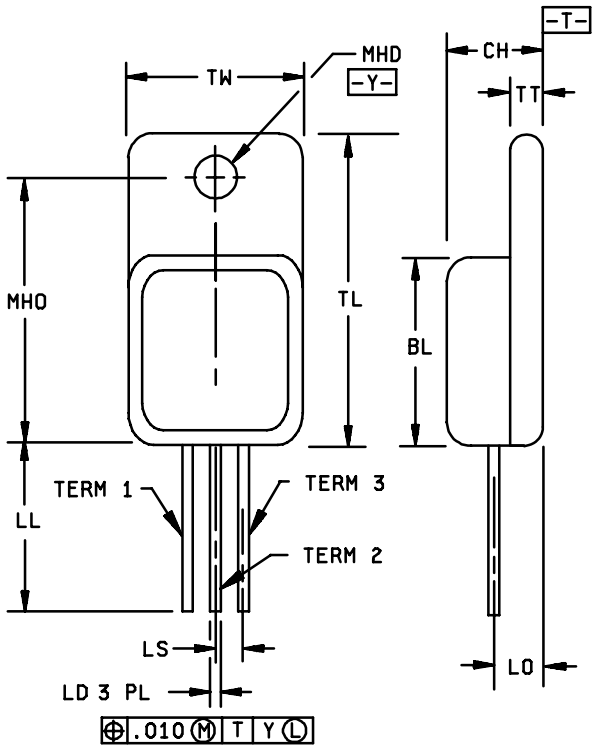
Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.535	.545	13.59	13.89
CH	.249	.260	6.32	6.60
LD	.035	.045	0.89	1.43
LL	.530	.550	13.46	13.97
LO	.150 BSC		3.81 BSC	
LS	.150 BSC		3.80 BSC	
MHD	.139	.149	3.53	3.78
MHO	.665	.685	16.89	17.40
TL	.790	.800	20.07	20.32
TT	.040	.050	1.02	1.27
TW	.535	.545	13.59	13.89
Term 1	Base			
Term 2	Collector			
Term 3	Emitter			



NOTES:
1. Dimensions are in inches.
2. Millimeters equivalents are given for general information only.
3. Methods used for electrical isolation of terminals feedthroughs shall employ materials that contain a minimum of 90 percent AL203 (ceramic).
4. In accordance with ANSI Y14.5M, diameters are equivalent to ϕ symbology.

FIGURE 3. Dimensions and configuration 2N6249T1, 2N6250T1, and 2N6251T1 (TO-254AA).

*



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.410	.430	10.41	10.92
CH	.190	.200	4.83	5.08
LD	.025	.035	0.64	0.89
LL	.500	.750	12.70	19.05
LS	.100 BSC		2.54 BSC	
MHD	.140	.150	3.56	3.81
MHO	.527	.537	13.39	13.63
TL	.645	.665	16.38	16.89
TT	.035	.045	0.89	1.14
TW	.410	.420	10.41	10.67
Term 1	Base			
Term 2	Collector			
Term 3	Emitter			

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Methods used for electrical isolation of the terminals feedthroughs shall employ materials that contain a minimum of 90 percent AL2O3 (ceramic).
4. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

* FIGURE 4. Dimensions and configuration for 2N6249T3, 2N6250T3 and 2N6251T3 (T0-257AA).

3. REQUIREMENTS

3.1 General. The individual item requirements shall be as specified in MIL-PRF-19500 and as modified herein.

3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturer's list (QML) before contract award (see 4.2 and 6.3).

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500.

* 3.4 Interface and physical dimensions. Interface and physical dimensions shall be as specified in MIL-PRF-19500, and on figure 1 (TO-3), figure 2 (die), figure 3 (TO254AA), and figure 4 (TO257AA) herein.

3.4.1 Lead finish. Lead finish shall be solderable in accordance with MIL-PRF-19500, MIL-STD-750, and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see 6.2).

3.5 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3 and 1.4.

3.6 Electrical test requirements. The electrical test requirements shall be in accordance with table I as specified herein.

3.7 Marking. Marking shall be in accordance with MIL-PRF-19500.

3.8 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.2).

b. Screening (see 4.3).

c. Conformance inspection (see 4.4).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500 and as specified herein.

4.2.1 JANHC and JANKC qualification. JANHC and JANKC qualification inspection shall be in accordance with MIL-PRF-19500.

* 4.2.2 Group E qualification. Group E qualification shall be performed herein for qualification or requalification only. In case qualification was awarded to a prior revision of the associated specification that did not request the performance of table II tests, the tests specified in table II herein shall be performed by the first inspection lot to this revision to maintain qualification.

4.3 Screening (JANS, JANTX, and JANTXV levels only). Screening shall be in accordance with table IV of MIL-PRF-19500 and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table IV of MIL-PRF-19500)	Measurements	
	JANS	JANTX and JANTXV levels
(1) 3c	Thermal impedance, method 3131 of MIL-STD-750	Thermal impedance, method 3131 of MIL-STD-750
9	I_{CEX1} and H_{FE1}	I_{CEX1} and H_{FE1}
11	I_{CEX1} and H_{FE1} I_{CEX1} = 100 percent of initial value or 10 µA dc, whichever is greater; H_{FE1} = ± 15 percent of initial value.	I_{CEX1} and H_{FE1}
12	See 4.3.1	See 4.3.1
13	Subgroup 2 and 3 of table I herein; I_{CEX1} = 100 percent of initial value or 10 µA dc, whichever is greater; H_{FE1} = ± 25 percent of initial value.	Subgroup 2 of table I herein; I_{CEX1} = 100 percent of initial value or 10 µA dc, whichever is greater; H_{FE1} = ± 25 percent of initial value.

(1) Thermal impedance ($Z_{\theta JC}$) limits shall not exceed figures 7, 8, and 9 thermal impedance curves.

4.3.1 Power burn-in conditions. Power burn-in conditions are as follows: V_{CB} = 100 V dc, T_A = +30°C maximum, method 1027, T_J = +175°C minimum.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500 and as specified herein. Group A inspection shall be performed on each sublot.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500 and table I herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VIa (JANS) and table VIb (JAN, JANTX, and JANTXV), of MIL-PRF-19500. Electrical measurements (end-points) shall be in accordance with table I, group A, subgroup 2 herein.

4.4.2.1 Group B inspection, table VIa (JANS) of MIL-PRF-19500.

Subgroup	Method	Condition
B3	2037	Test condition A, all internal leads for each device shall be pulled separately.
B4	1037	V_{CE} = 20 V dc minimum; 2,000 cycles.
B5	1027	V_{CB} = 10 V dc minimum; adjust T_A and P_D to achieve T_J = +275°C minimum. P_D = 100 percent of rated P_T minimum.
B6	3131	See 4.5.2.

4.4.2.2 Group B inspection, table VIb (JANTX and JANTXV) of MIL-PRF-19500.

Subgroup	Method	Condition
B3	1037 or 1027	$V_{CE} \geq 20$ V dc minimum; 2,000 cycles. $V_{CE} \geq 20$ V dc minimum; $T_J = +175°C$ minimum; $T_A = +30°C$ maximum.
B5	3131	See 4.5.2.See thermal impedance curves figures 7, 8, and 9

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VII of MIL-PRF-19500. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein.

4.4.3.1 Group C inspection, table V of MIL-PRF-19500.

Subgroup	Method	Condition
C2	2036	Test condition A; weight - 10 pounds; time - 15 seconds.
C3	2016	Non-operating 1,500 G; 0.5 ms, 5 blows in each orientation: X_1, Y_1, Y_2, Z_1 (total 20 blows).
C6	1027 or 1037	$V_{CE} \geq 20$ V dc minimum; $T_J = +175°C$ minimum; $T_A = +30°C$ maximum. 6,000 cycles; $V_{CE} \geq 20$ V dc.

4.4.5 Group E inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table IX of MIL-PRF-19500 and as specified herein. Electrical measurements (end-points) shall be in accordance with table I, group A, subgroup 2 herein.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows.

4.5.1 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of MIL-STD-750.

4.5.2 Thermal resistance. Thermal resistance measurement shall be conducted in accordance with test method 3131 of MIL-STD-750. The following details shall apply:

a. Collector current magnitude during power applications shall be 3.0 A dc.

b. Collector to emitter voltage magnitude shall be 10 V dc.

c. Reference temperature measuring point shall be the case.

d. Reference point temperature shall be $+25°C \leq t_r \leq +75°C$ and recorded before the last is started.

e. Mounting arrangement shall be with heat sink to header.

* f. Maximum limit for $R_{\theta JC}$ see thermal impedance curves figures 7, 8, and 9.

4.5.3 Coil selection for safe operating area (SOAR) tests. In selecting coils for use in the clamped and unclamped inductive SOAR tests, prime consideration should be given to the recommended commercially available coil. However, due to the extreme critical nature of the coil in these circuits and the wide tolerance of some commercially available coils (+100, -50 percent), it shall be the semiconductor manufacturer's responsibility, to prove upon request, compliance or equivalency of any coil used (commercial or in-plant designed) to within (+20, -10 percent), of the specified inductance at the rated current and dc resistance.

TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical examination	2071					
Subgroup 2						
* Breakdown voltage, collector to emitter	3011	Bias condition D, I_C = 200 mA dc, L = 42 mH, f = 30 - 60 Hz (see figure 10).	$V_{(BR)CEO}$			
2N6249, 2N6249T1 2N6249T3				200		V dc
2N6250, 2N6250T1 2N6250T3				275		V dc
2N6251, 2N6251T1 2N6251T3				350		V dc
* Breakdown voltage, collector to emitter	3011	Bias condition D, I_C = 200 mA dc, L = 14 mH, f = 30 - 60 Hz R_{BE} = 50 ohms (see figure 10).	$V_{(BR)CER}$			
2N6249, 2N6249T1 2N6249T3				225		V dc
2N6250, 2N6250T1 2N6250T3				300		V dc
2N6251, 2N6251T1 2N6251T3				375		V dc
Emitter to base cutoff current	3061	Bias condition D, V_{EB} = 6 V dc.	I_{EBO}		100	µA dc
Collector to emitter cutoff current	3041	Bias condition D.	I_{CEO}			
2N6249, 2N6249T1 2N6249T3		V_{CE} = 150 V dc			1.0	mA dc
2N6250, 2N6250T1 2N6250T3		V_{CE} = 225 V dc			1.0	mA dc
2N6251, 2N6251T1 2N6251T3		V_{CE} = 300 V dc			1.0	mA dc
Collector to emitter cutoff current	3041	Bias condition D, V_{BE} = -1.5 V dc.	I_{CEO}			
2N6249, 2N6249T1 2N6249T3		V_{CE} = 225 V dc			90	µA dc
2N6250, 2N6250T1 2N6250T3		V_{CE} = 300 V dc			90	µA dc
2N6251, 2N6251T1 2N6251T3		V_{CE} = 375 V dc			90	µA dc

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 2 - Continued						
Collector to base cutoff current	3036	Bias condition D	I_{CBO}			
2N6249, 2N6249T1 2N6249T3		V_{CE} = 300 V dc			0.5	mA dc
2N6250, 2N6250T1 2N6250T3		V_{CE} = 375 V dc			0.5	mA dc
2N6251, 2N6251T1 2N6251T3		V_{CE} = 450 V dc			0.5	mA dc
Forward-current transfer ratio	3076	V_{CE} = 3 V dc; I_C = 10 A dc; Pulsed (see 4.5.1).	h_{FE}			
2N6249, 2N6249T1 2N6249T3				10	50	
2N6250, 2N6250T1 2N6250T3				8	50	
2N6251, 2N6251T1 2N6251T3				6	50	
Collector to emitter saturated voltage	3071	I_C = 10 A dc; pulsed (see 4.5.1).	$V_{CE(SAT)}$			
2N6249, 2N6249T1 2N6249T3		I_B = 1.0 A dc			1.5	V dc
2N6250, 2N6250T1 2N6250T3		I_B = 1.25 A dc			1.5	V dc
2N6251, 2N6251T1 2N6251T3		I_B = 1.67 A dc			1.5	V dc
Base to emitter saturated voltage	3066	Test condition A; I_C = 10 A dc; pulsed (see 4.5.1).	$V_{BE(SAT)}$			
2N6249, 2N6249T1 2N6249T3		I_B = 1.0 A dc			2.25	V dc
2N6250, 2N6250T1 2N6250T3		I_B = 1.25 A dc			2.25	V dc
2N6251, 2N6251T1 2N6251T3		I_B = 1.67 A dc			2.25	V dc
Subgroup 3						
High temperature operation		T_A = +125°C.				
Collector to emitter cutoff current	3041	Bias condition D, V_{BE} = -1.5 V dc.	I_{CEX1}			
2N6249, 2N6249T1 2N6249T3		V_{CE} = 225 V dc			90	µA dc
2N6250, 2N6250T1 2N6250T3		V_{CE} = 300 V dc			90	µA dc
2N6251, 2N6251T1 2N6251T3		V_{CE} = 375 V dc			90	µA dc

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 3 - Continued						
Low-temperature operation		T_A -55°C.				
Forward-current transfer ratio	3076	V_{CE} = 3 V dc; I_C = 10 A dc; pulsed (see 4.5.1).				
2N6249, 2N6249T1 2N6249T3				5		
2N6250, 2N6250T1 2N6250T3				4		
2N6251, 2N6251T1 2N6251T3				3		
* Subgroup 4						
Pulsed response:	3251	Test conditions A except test circuit and pulse requirements in accordance with figure 11.	t_{on}			
Turn-on time		V_{CC} = 200 V dc; I_C = 10 A dc.				
2N6249, 2N6249T1 2N6249T3		I_B = 1.0 A dc			2.0	µS
2N6250, 2N6250T1 2N6250T3		I_B = 1.25 A dc			2.0	µS
2N6251, 2N6251T1 2N6251T3		I_B = 1.67 A dc			2.0	µS
Turn-off time		V_{CC} = 200 V dc; I_C = 10 A dc.	t_{off}			
2N6249, 2N6249T1 2N6249T3		I_B = 1.0 A dc			4.5	µS
2N6250, 2N6250T1 2N6250T3		I_B = 1.25 A dc			4.5	µS
2N6251, 2N6251T1 2N6251T3		I_B = 1.67 A dc			4.5	µS
Magnitude of small signal short-circuit forward-current transfer ratio	3306	V_{CE} = 10 V dc; I_C = 1.0 A dc; f = 1 MHz.	h_{FE}	2.5	15	
Open capacitance open circuit	3236	V_{CE} = 10 V dc; I_C = 0 A dc; 100 kHz ≤ f ≤ 1 MHz.	C_{OBO}		500	pF

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
* Subgroup 5						
Safe operating area (dc operation)	3051	TC = +25C; t = 1 s; 1 cycle (see figure 12).				
Test 1		I_C = 10 A dc; V_{CE} = 17.5 V dc				
Test 2		I_C = 5.8 A dc; V_{CE} = 30 V dc				
Test 3		I_C = 0.3 A dc; V_{CE} = 100 V dc 2N6249, 2N6249T1, and 2N6249T3 only				
Test 4		I_C = 0.13 A dc; V_{CE} = 200 V dc 2N6250, 2N6250T1, and 2N6250T3 only				
Test 5		I_C = 0.09 A dc; V_{CE} = 275 V dc 2N6251, 2N6251T1, and 2N6251T3 only				
Test 6		I_C = 0.065 A dc; V_{CE} = 350 V dc				
* Subgroup 6						
Safe operating area (switching)	3053	Load condition C; (unclamped inductive load) See figure 13.				
		T_C = +25°C; duty cycle ≤ 10 percent; R_S = 0.1.				
Test 1		$T_P \approx$ 5 ms (vary to obtain I_C); R_{BB1} = 2Ω V_{BB1} = 10 V dc R_{BB2} = 50Ω V_{BB2} = 4 V dc V_{cc} = 10 V dc I_C = 10 A dc L = 50 µH at 10 A dc				
Test 2		$T_P \approx$ 5 ms (vary to obtain I_C); R_{BB1} = 40Ω V_{BB1} = 10 V dc R_{BB2} = 50Ω V_{BB2} = 4 V dc V_{cc} = 10 V dc I_C = 2.0 A dc L = 500 µH at 2.0 A dc R_L 0.01Ω				

See footnote at end of table.

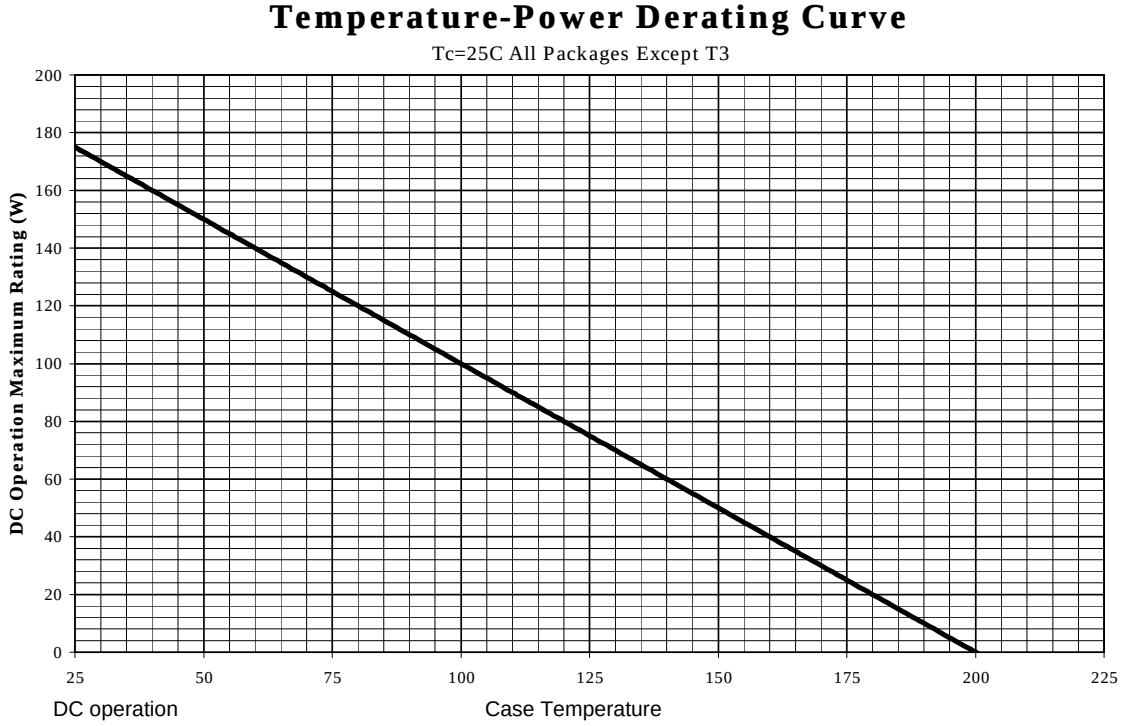
TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
* Subgroup 7 Safe operating area (switching)		(See figure 14) TC = +25C; duty cycle ≤ 10 percent; $T_P \approx 5$ ms (vary to obtain I_C); $R_S = 0.1\Omega$ $V_{CC} = 10$ V dc $I_C = 10$ A dc Clamp voltage: 2N6249, 2N6249T1 2N6249T3 = 200 V dc 2N6250, 2N6250T1 2N6250T3 = 275 V dc 2N6251, 2N6251T1 2N6251T3 = 350 V dc				

1/ For sampling plan, see MIL-PRF-19500.

* TABLE II. Group E inspection (all quality levels) - for qualification only.

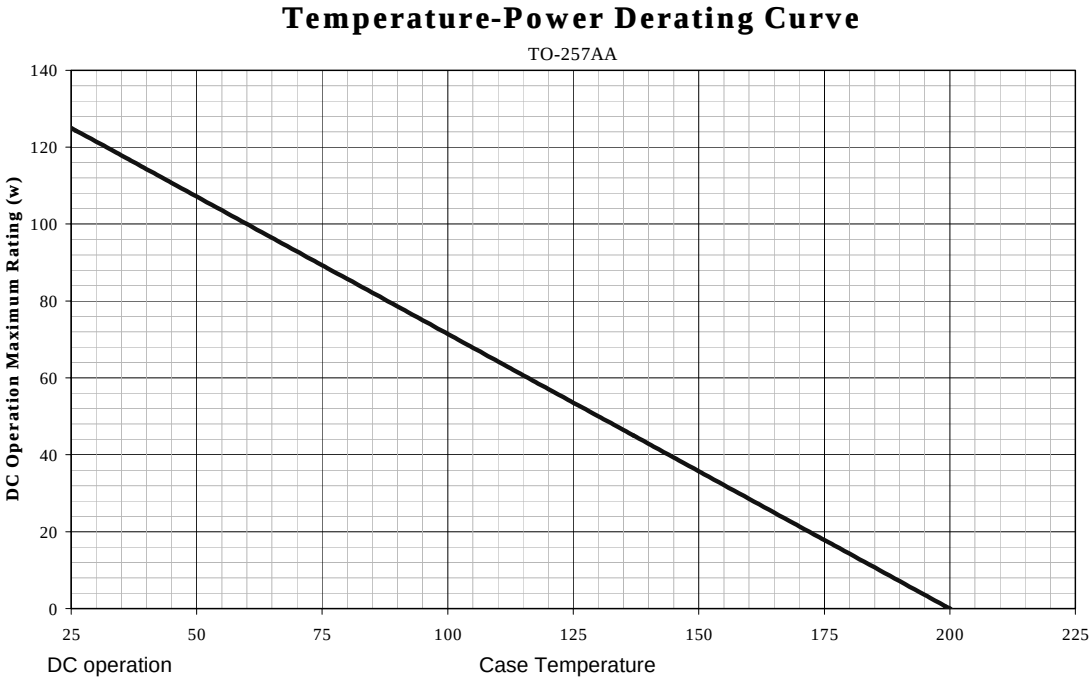
Inspection	MIL-STD-750		
	Method	Conditions	
Subgroup 1			45 devices c = 0
Temperature cycling (air to air) Hermetic seal	1051 1071	Test condition C, 500 cycles.	
Fine leak Gross leak			
Electrical measurements		See group A, subgroup 2 and 4.5.3 herein.	
Subgroup 2			45 devices c = 0
Intermittent life	1037	Intermittent operation life: VCB = 10 V dc, 6,000 cycles.	
Electrical measurements		See group A, subgroup 2 and 4.5.3 herein.	
Subgroups 3			3 devices c = 0
Destructive Physical Analysis	2102		
Subgroup 4			
Thermal impedance curves		Each supplier shall submit their (typical) design thermal impedance curves. In addition, test conditions and $Z_{\theta JX}$ limit shall be provided to the qualifying activity in the qualification report.	15 devices c = 0
Subgroups 5 and 6			
Not applicable			
Subgroup 8			45 devices c = 0
Reverse stability	1033	Condition A for devices ≥ 400 V, condition B for Devices < 400 V.	



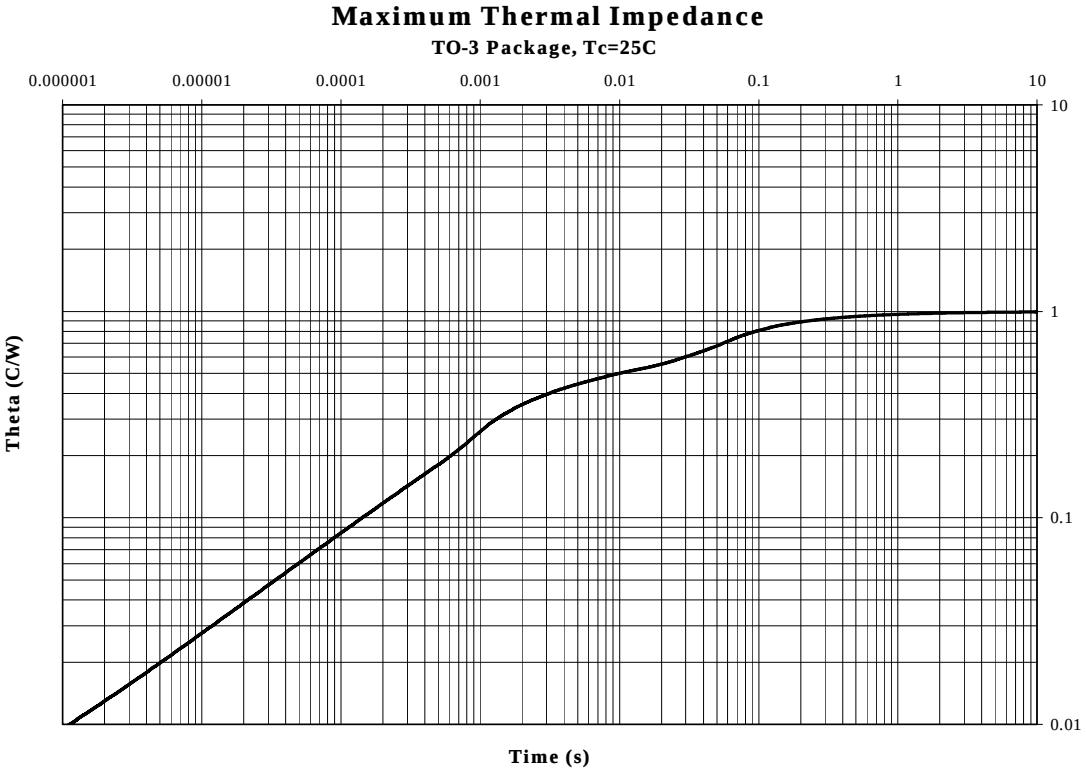
Thermal Resistance Junction to Case ($R_{\theta JC}$) = 1.0°C/W

Note: Maximum Finish-Alloy Temperature = 175°C for lead tin solder alloys.

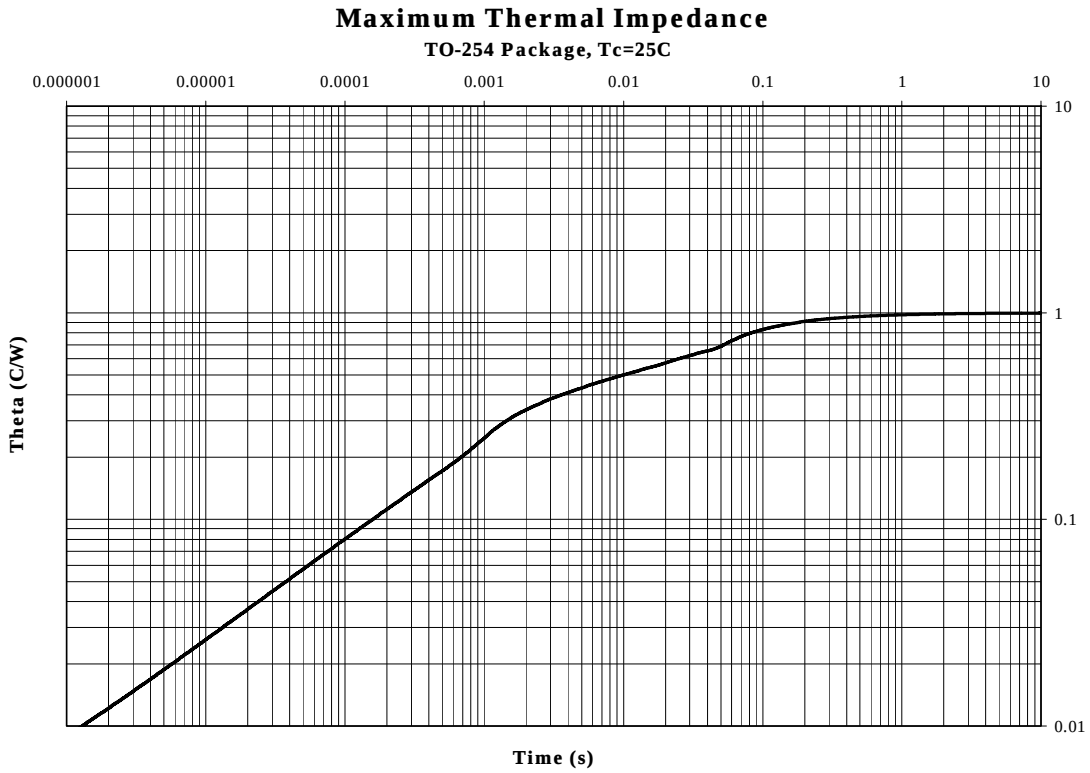
* FIGURE 5. Derating for all devices except the T3 devices.



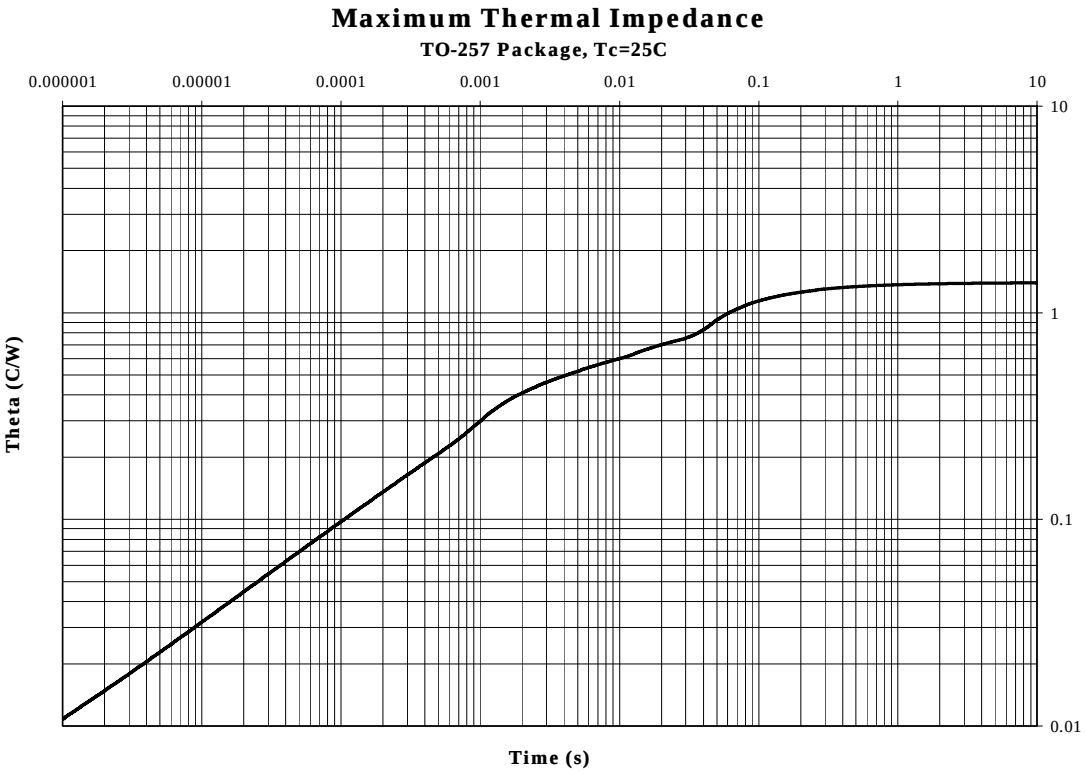
* FIGURE 6. Derating for T3 packages.



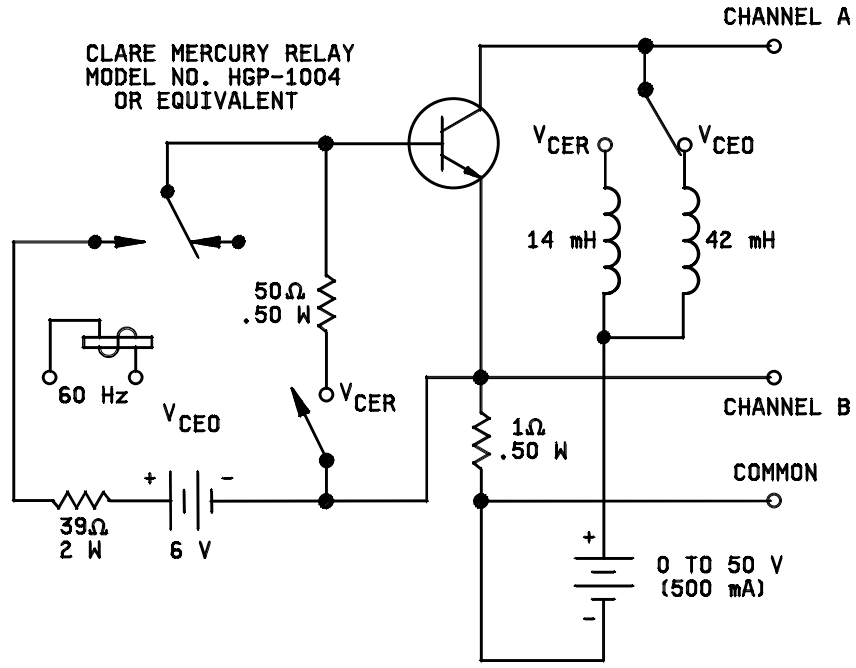
* FIGURE 7. Thermal impedance graph for 2N6249 and 2N6250, and 2N6251 (TO-3).

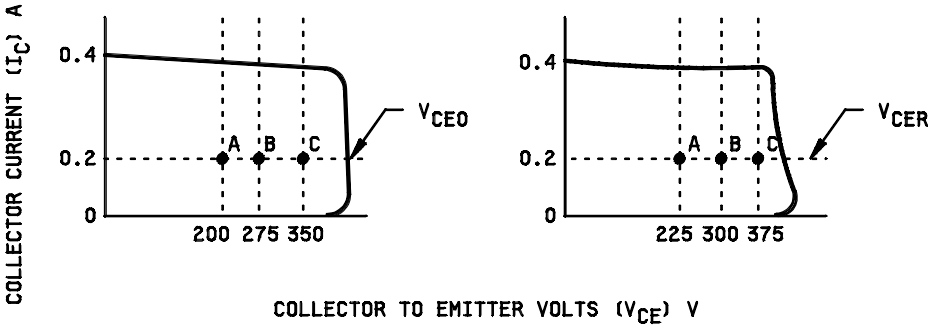


* FIGURE 8. Thermal impedance graph for 2N6249T1 and 2N6250T1, and 2N6251T1 (TO254AA).



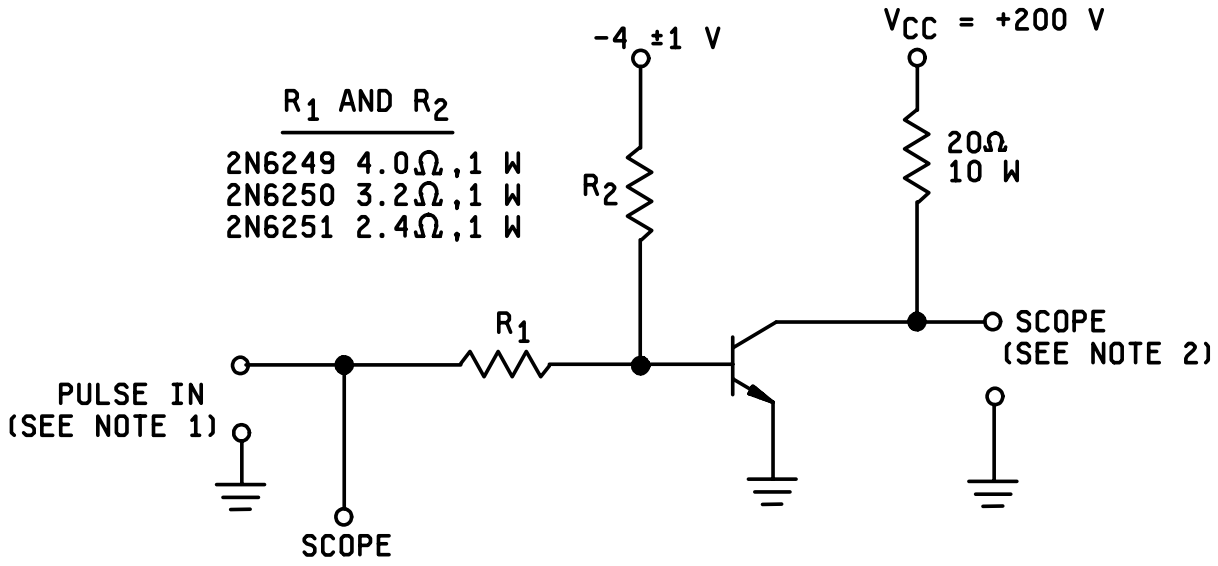
* FIGURE 9. Thermal impedance graph for 2N6249T3 and 2N6250T3, and 2N6251T3 (TO254AA).

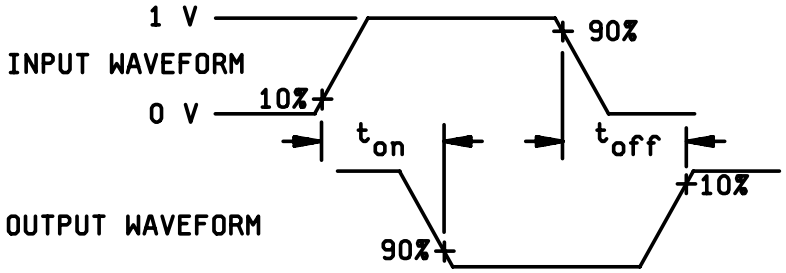




NOTE: The sustaining voltages V_{CEO} and V_{CER} are acceptable when the traces fall to the right of point “A” for type 2N6249 and 2N6249T1, point “B” for type 2N6250 and 2N6250T1, and point “C” for type 2N6251 and 2N6251T1 (I_C = 0.2 A).

FIGURE 10. V_{CEO}, V_{CER} measurement circuit.





NOTES:

1. The rise time (t_r) and the fall time (t_f) of the applied pulse shall be each < 20 ns, duty cycle ≤ 2 percent; generator source impedance shall be 50 Ω; pulse width = 20 μs.

2. Output sampling oscilloscope; Z_{in} ≥ 100 Ωk; c_{in} ≤ 50 pF, rise time < 2 ns.

FIGURE 11. Pulse response test circuit.

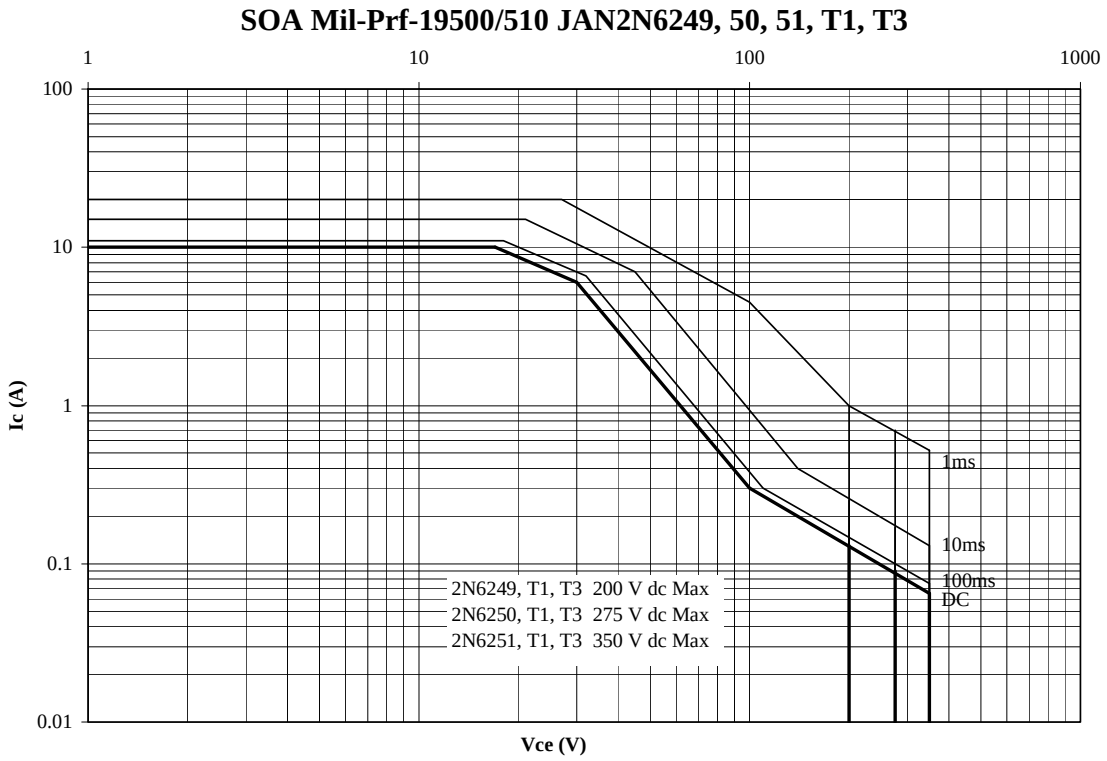


FIGURE 12. Maximum safe operating area graph (continuous dc).

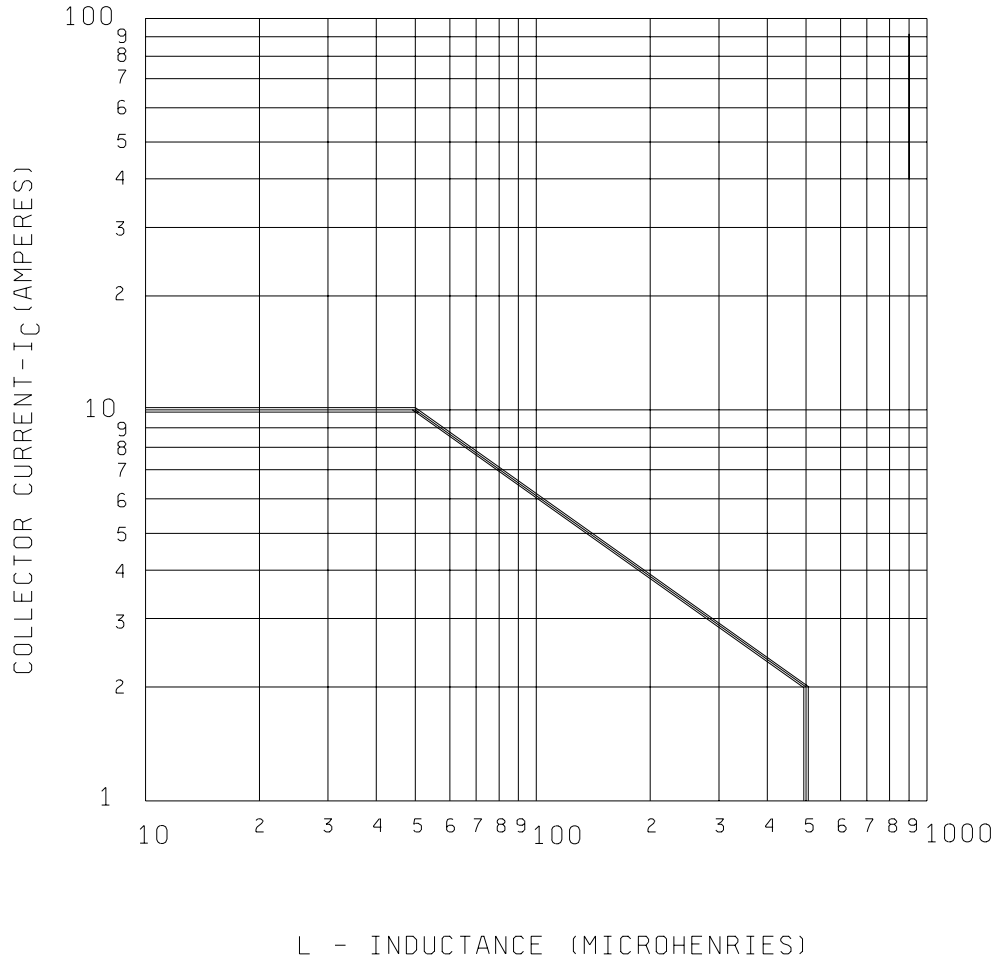
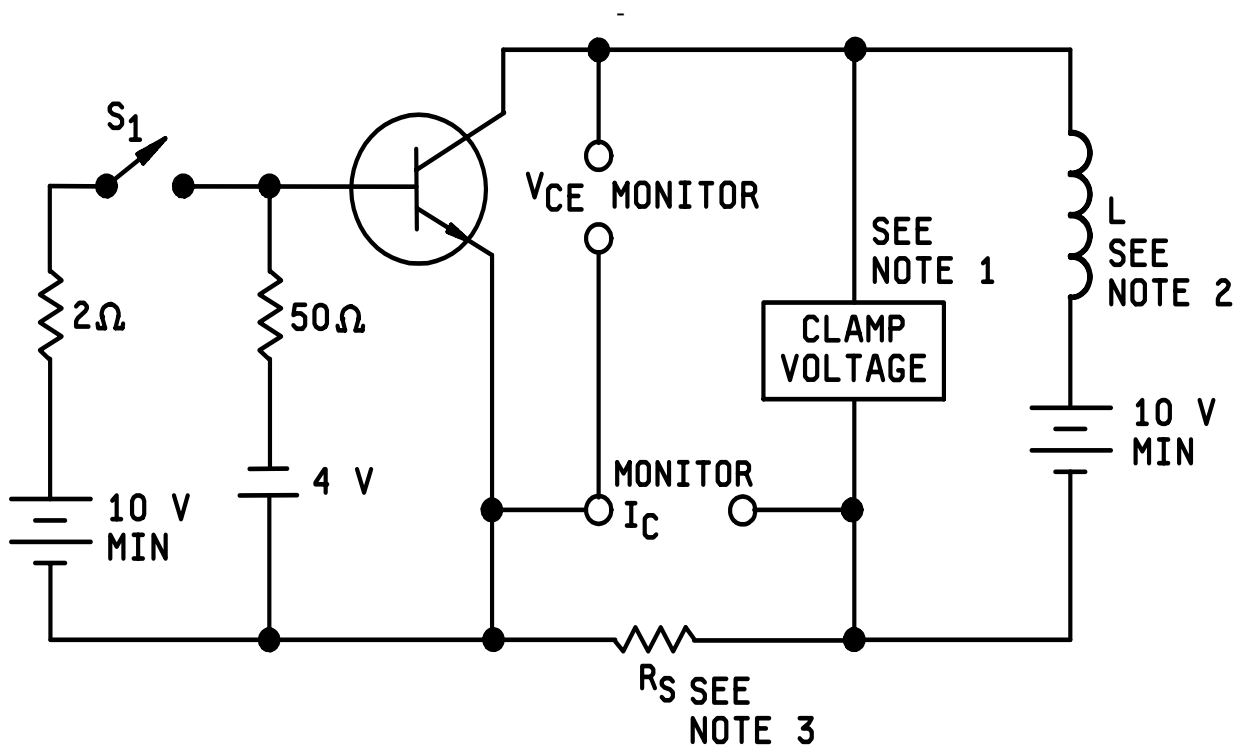


FIGURE 13. Safe operating area for switching between saturation and cutoff (unclamped inductive load).

-



NOTES:
1. Either a clamping circuit or clamping diode may be used.
2. The coil used shall provide a minimum inductance of 50 μH at 10 A with a maximum dc resistance of 0.1Ω (see 4.5.3).
3. $R_S \leq 0.1\Omega$, 12 W, 1 percent tolerance maximum (noninductive).

Procedure:
1. With switch S1 closed set the specified test conditions.
2. Open S1. Device fails if clamp voltage not reached and maintained until the current returns to zero.
3. Perform specified end-point tests.

FIGURE 14. Clamped inductive sweep test circuit.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The notes specified in MIL-PRF-19500 are applicable to this specification.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of this specification.

b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1).

c. Packaging requirements (see 5.1).

d. Lead finish (see 3.4.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers' List (QML) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center, Columbus, ATTN: DSCC/VQE, P.O. Box 3990, Columbus, OH 43216-5000.

* 6.4 Suppliers of JANC die. The qualified JANC suppliers with the applicable letter version (example, JANHC6249) will be identified on the QML. The Part or Identifying Number (PIN) is listed below:

JANC ordering information		
	Manufacturer	
PIN	33178	
2N6249	A6249	
2N6249T1	A6249T1	
2N6249T3	A6249T3	
2N6250	A6250	
2N6250T1	A6250T1	
2N6250T3	A6250T3	
2N6251	A6251	
2N6251T1	A6251T1	
2N6251T3	A6251T3	

6.5 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Air Force - 11
DLA - CC

Review activities:
Air Force - 19, 99

Preparing activity:
DLA - CC

(Project 5961-2621)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.

2. The submitter of this form must complete blocks 4, 5, 6, and 7.

3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-PRF-19500/510D	2. DOCUMENT DATE 2 MAY 2003

3. **DOCUMENT TITLE** SEMICONDUCTOR DEVICE, TRANSISTOR, NPN, SILICON, POWER TYPE 2N6249, 2N6249T1, 2N6249T3, 2N6250, 2N6250T1, 2N6250T3, 2N6251, 2N6251T1, 2N6251T3 JAN, JANTX, JANTXV AND JANS, JANHC AND JANKC

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) COMMERCIAL DSN FAX EMAIL	7. DATE SUBMITTED

8. PREPARING ACTIVITY

a. Point of Contact Alan Barone	b. TELEPHONE Commercial 614-692-0510	DSN 850-0510	FAX 614-692-6939	EMAIL alan.barone@dla.mil
c. ADDRESS Defense Supply Center Columbus ATTN: DSCC-VAC P.O. Box 3990 Columbus, OH 43216-5000	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman, Suite 2533 Fort Belvoir, VA 22060-6221 Telephone (703) 767-6888 DSN 427-6888			